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A Standard Scale for Telescopic Observation.
By Percival Lowell.

(*Communicated by the Secretaries.*)

Professor W. H. Pickering was quite right in calling attention to the origin of " A Standard Scale for Telescopic Observation." It was devised by him, although he modestly does not mention himself directly in the matter; and he deserves great credit for having devised it, as it is the only absolute scale—that is, the only one independent of the personal equation—which has yet been suggested. For large telescopes it needs to be compressed at the lower and expanded at the upper end, as it is a function of the aperture, and for exactness it must be supplemented by a record of the bodily motion as shown by Mr. A. E. Douglass: "Atmosphere, Telescope, and Observer" (*Popular Astronomy*, 1897), and "Scales of Seeing" (*Popular Astronomy*, 1898).

Since it was first put in practice—at Arequipa and Flagstaff—much further knowledge about what makes good or bad seeing has been obtained through the study of the air-currents by Mr. A. E. Douglass, for some years connected with this observatory. To his research we are indebted for the practical results, though not for the original detection of the air-currents which make or mar the seeing, and for the practical results which flow from their observation. In the course of this research it has thus been found, for example, that clear-cutness of the limb is not a sure test in planetary observations. The air-currents may be such as to give a sharp limb and poor detail definition, or a poor limb and good detail, or to show both limb and detail clearly. It seems to be a matter of the size of the waves. An observer, judging of a planet as a whole, might easily suppose he was having seeing good enough to show certain detail if it existed, whereas he was not; and *vice versa* he might distrust realities as illusions.

It seems to be absolutely necessary to refer to the stars as a criterion for the reason that otherwise too much is left to the discrimination of the observer. Reference to the condition of the terminator or to any other special feature is too much a matter of individual skill to be generally advisable. A scale to be universal must be as simple and impersonal in practice as it is correct in principle.

Lowell Observatory, Flagstaff, A.T.:
1903 *March* 9.

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Transits observed with the Durham Almucantar between 1901 *November* 23 *and* 1902 *December* 15.

By Prof. R. A. Sampson.

The Durham Almucantar has now been in use upon a settled plan for a sufficiently long time to show the quality of the work it can do. It seems of interest to publish the results without delay, although I do not doubt that a few years more of observation will improve them materially. I have therefore collected the observations made between 1901 November 23 and 1902 December 15, which have been taken and reduced upon a uniform plan, that may be looked upon as a final and approved one except in small points of detail.

The question which I proposed to solve with the almucantar was its title to compete with the finest transit circles in the fundamental work of finding star places, and in the course of this study to determine how to use it to the best advantage, and what were its weak and strong points. In fact, I proposed a thorough and extended revision and continuation of Mr. S. C. Chandler's original investigation, published in vol. xvii. of the *Harvard Annals.*

Striking as Mr. Chandler's work is, it is usually found that an inventor's methods are liable to improvement, and some of the modifications I have introduced are not immaterial.

Almost all the observations recorded below were taken by Mr. F. C. H. Carpenter. It was my original intention to share equally with him in the observations, and it is my hope to do so at some future time; but the earlier experimental work and the various changes made before the observing ran smoothly, with theoretical investigations, revision of reductions, and discussion of results absorbed the time I could spare so completely that I have been obliged for the present to give up the additional heavy tax that observing imposes.

Meanwhile it is perhaps as well to offer a completely homogeneous group by one observer as a specimen of what the instrument will do.

§ 1. *The Durham Almucantar as at present used.*

A general description of the almucantar as set up at Durham was published in *Monthly Notices*, 1900 June (vol. lx. p. 572).

Without repeating these details I may say briefly that it is an instrument for taking transits, with horizontal wires, movable in azimuth, and clamped at the altitude of the pole. Its characteristic feature is that the movable parts are floated on a mercury bath, and it is in the first place assumed that after a disturbance such as arises from setting to a fresh azimuth, the telescope settles down to the same Z.D. as before. Each star

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